

THE USE OF POSITIVE REINFORCEMENT IN CONDITIONING ATTENDING BEHAVIOR¹

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Individual conditioning techniques were applied in a controlled setting to increase attending behavior of an underachieving 9-yr-old male subject. The procedure involved: (1) determining a stable response pattern, (2) introducing a treatment variable to establish a high rate of task-attending behavior, (3) measuring the effect of withdrawal of the treatment variable after attaining criterion performance, and (4) transferring control to the classroom. The interval of attending behavior required for reinforcement was systematically increased from 30 sec to 600 sec as the behavior came under experimental control. Manipulating the reinforcing contingencies measurably changed the proportion of attending behavior and the frequency and duration of non-attending events. Once the behaviors were under experimental control, procedures were established to program generalization and to maintain the behavior outside the experimental setting.

In the last decade, conditioning techniques have been used effectively to establish a variety of response classes in children (*e.g.*, Patterson, 1965*a*, 1965*b*; Wolf, Risley, and Mees, 1964; Williams, 1959; Hart, Allen, Buell, Harris, and Wolf, 1964). Conditioning techniques have been applied to parent-child interactions, hyperactivity, vomiting, stuttering, tantrums, operant crying, and encopresis in order to modify these behaviors in preferred directions. The results of these studies have provided impressive evidence for the efficacy and generality of these techniques.

Two important features of these techniques are that they have been applied under carefully controlled conditions and have focused on the behavior of individual subjects. The application of conditioning techniques in single subject designs permits manipulation of setting events and reinforcing stimuli and the evaluation of treatment effects by (1) establishing stable response rates, (2) introducing a treatment or controlling variable, and (3) withdrawing that variable (after criterion performance) in order to measure its effect upon behavior.

The purpose of the present study was to evaluate the effects of a shaping program for attending behavior of a 9-yr-old subject and to transfer control to the regular classroom.

PROCEDURES AND RESULTS

Subject and Setting

Phillip was a bright (WISC: 116), underachieving male who, upon referral, exhibited a number of deviant behaviors that were incompatible with successful, task-oriented performance in the classroom setting. Phillip was enrolled in the fourth grade and his chronological age at referral was 9 yr 6 months. His deviant behaviors in the classroom reportedly included verbally and physically provoking other children, not completing tasks, making loud noises and comments, coercing attention from the teacher, talking out of turn, and being easily distracted from a given task by ordinary classroom stimuli such as minor noises, movements of others, changes in lighting conditions, and a number of other stimuli common to a classroom setting. A series of observations from the regular classroom (totaling 100 min) indicated that he attended to assignments only 42% of the time.

The subject was enrolled in an experimental class for behaviorally disordered children for two months of the 1966-67 school year. Behaviors which were directly incompatible with appropriate social behavior and successful

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academic performance gradually decreased in frequency as Phillip's behavior appeared to come under control of the reinforcement contingencies established within the experimental class setting. Our observations indicated that his academic task rate increased markedly and his social behaviors appeared more appropriate and more easily tolerated by his peers. (Walker and Mattson, 1967.) Phillip's distractive behavior, however, continued at a high rate, even though consequences such as teacher approval and points earned for tangible objects were consistently withheld when he was not attending to his assignment.

Phillip's attending behavior appeared to be task-specific (Moyer and von Haller Gilmer, 1955) in that it seemed to vary with the given assignment. He appeared to work well in a programmed reading text (Sullivan Series) but seemed to produce very little from teacher-assigned work such as math problems. His attending behavior continued at a low rate in spite of "treatment", apparently because of the experimenter's inability to manipulate such controlling variables as: a large number of potentially distracting stimuli in the treatment setting, attention from peers for distractive behavior, escape from academic work, and reinforcement from frequent substitute activities (Goldstein and Seigle, 1961). As this behavior was not being controlled effectively in the experimental class setting, an individual conditioning program was designed for administration in a setting where these sources of distractive stimuli could be controlled.

Individual conditioning program. The educational task during baseline and treatment sessions consisted of programmed learning material. The subtraction and addition texts A-B, Lessons for Self-Instruction in the Basic Skills published by the California Test Bureau, were used throughout the conditioning program. The same texts were used in an attempt to control interest and difficulty factors. The programmed texts also reduced the number of task-related questions that the subject had to ask for purposes of explanation and clarification. No feedback was provided about the correctness of responses other than that provided by the text.

The subject participated in 40-min treatment sessions five days a week. The sessions each day were divided into three 10-min time blocks with 3-min breaks occurring after the

first and second 10-min block each day. Treatment sessions were conducted in a setting where extraneous stimuli were reduced to a minimum. The setting contained a table, two chairs, a lamp, and the educational task material used by the subject.

After the subject's task rate and attending behavior had stabilized (Sidman, 1960) during baseline observations, the scheduled contingencies were described to the subject before the treatment condition began. The subject was told that when a given interval of time had elapsed, in which no distractions had occurred, a click would sound and the experimenter would enter a single check mark in a cumulative recording form which would indicate that the subject had earned a point. The subject was told that attending to the click represented a distraction and would result in loss of the point for that interval. The subject was allowed to exchange his points for a model of his choice at the conclusion of the treatment period. The number of points necessary for the model (160) was specified to the child when treatment began.

The response measure was established in accordance with Martin and Powers (1967) operant conditioning analysis of attention span. Attending behaviors for the subject involved looking at the assigned page, working problems, and recording responses. Non-attending behaviors were defined as those which were incompatible with task-oriented (attending) behavior. The following observable behaviors were classified as non-attending: (a) looking away from the text and answer sheet by eye movements or head turning; (b) bringing an object into his field of vision with head and eyes directed toward paper (other than pencil, book, and answer sheet necessary for the task); and (c) making marks other than those necessary for the task (*e.g.*, doodling).

During recording, the following notational system was used: (a) Z = beginning of a new attending period, (b) \checkmark = continuation of the same event through successive 10-sec intervals, (c) / = a reinforcement (an audible click indicated reinforcement), and (d) — = subject attended to the click. A sample observation is given in Fig. 1.

The data in Fig. 1 are decoded as follows: 60 sec of attending behavior (interval six) was reinforced; Phillip attended to the sound of the click and immediately lost the point he

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
z	✓	✓	✓	✓	✓	✓	--							z	✓	✓	✓				z		z	✓	✓	✓	✓	✓	✓

*Each time interval represents 10 sec

Fig. 1. Sample observation form.

had earned (interval seven); and non-attending sequence continued through the next seven intervals (interval 14); a new sequence of attending behavior occurred in intervals 15 and continued through 18, followed by 30 sec of non-attending; a new attending behavior began and terminated in interval 22 followed by a distraction (interval 23); attending behavior started in interval 24 and continued through interval 30 with reinforcement being delivered after interval 29.

Before data collection began, the senior author took simultaneous recordings of Phillip's attending behavior with observers who recorded his performance throughout the experi-

ment. Inter-rater reliabilities were calculated by a percent agreement method in which number of agreements were divided by the total number of time intervals. These reliabilities ranged from 0.65 to 0.98. The initial training sessions were terminated when inter-rater reliability was 0.90 or above for five randomly selected time samples (10 min) of attending behavior. Simultaneous recordings were also taken periodically during the treatment process in order to provide a continual check on the inter-observer reliability. Agreement remained at 0.90 or above.

The intervals of attending behavior which met the criterion for reinforcement were: 30,

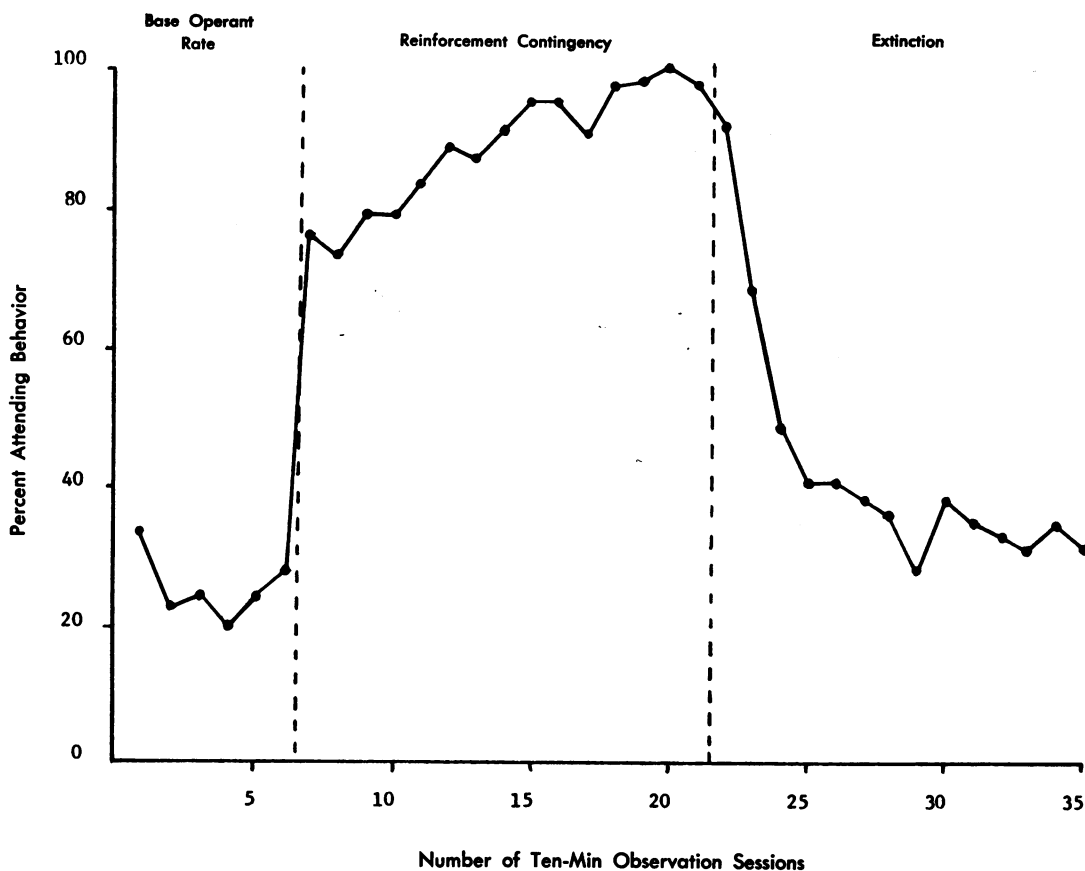


Fig. 2. Percentage of attending behavior in successive time samples during the individual conditioning program.

60, 120, 240, 480, and 600 sec. When Phillip had completed 20 intervals of 30-sec duration in which no non-attending sequences had occurred, the interval length was doubled to 60 sec. Thus, to proceed from one response interval criterion to another, the subject had to produce 10 min of attending behavior, *e.g.*, 20×30 sec equals 600 sec or 10 min, or 10×60 sec equals 600 sec, or 10 min total. The conditioning program was administered according to the schedule in Table 1.

During the initial criterion level of 30 sec, one point was administered on 20 separate occasions. In the final criterion interval of 600 sec, a total of 20 points was administered on *one* occasion (at completion of the interval). The reinforcement contingency was with-

Table 1
Graduated scale for changing response intervals and administering reinforcers.

# of Successfully Completed Intervals	Duration of Interval	# of Reinforcers Received
		(Events) (Points)
20	30 sec	20×1
10	60 sec	10×2
5	120 sec	5×4
2.5	240 sec	2.5×8
1.2	480 sec	1.2×16
1 *	600 sec	1×20

*Completed three intervals to criterion.

drawn when the subject had completed three 10-min distraction-free intervals in succession. As can be seen in Fig. 2, the subject's at-

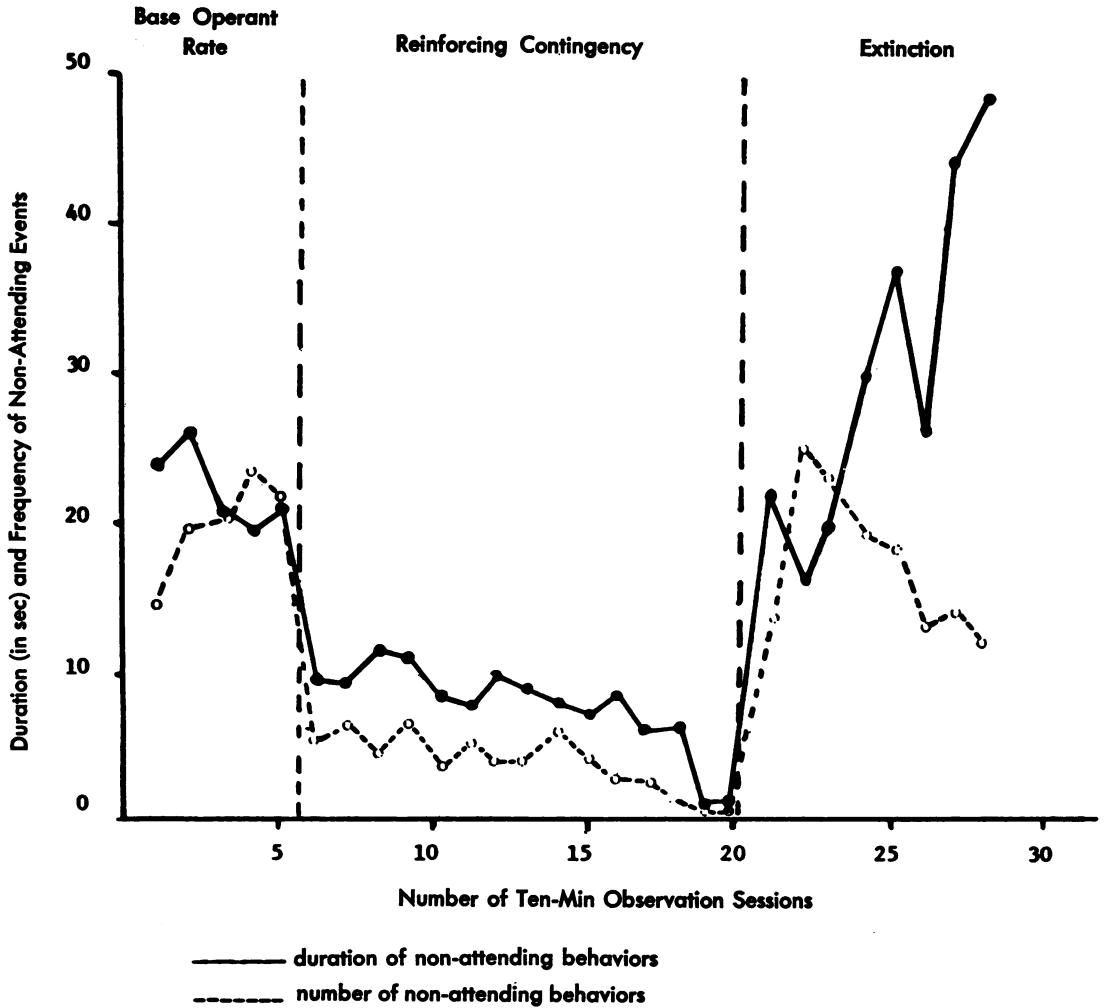


Fig. 3. Mean duration and frequency of non-attending events per 10-min session during the individual conditioning program.

tending behavior was quite low during the Base Operant Rate Condition, averaging only 33% of the sessions. Introduction of the Reinforcement Contingency Condition immediately increased attending behavior, which grew to average 93% of the sessions. When the reinforcement contingency was withdrawn, under the extinction condition, the attending behavior declined to its original lower level, averaging 44% of the sessions.

In Fig. 3, the response measures of duration and frequency of non-attending events displayed a similar alteration in rate when the experimental variable was manipulated. During Base Operant Rate, the mean duration of non-attending events was 21 sec and the mean frequency was 19 non-attending events per 10-min time sample. These rates were reduced to zero by the end of the Reinforcement Contingency period. During extinction, frequency of non-attending behaviors returned to pretreatment levels, but the duration of non-attending behavior rose far above its baseline rate.

Generalization program. When the subject's behavior had returned to baseline levels, after the reinforcement contingency was withdrawn, Phillip was placed on a variable-interval schedule in the regular classroom setting where his behavior was reinforced (on the average) with one point for each 30-min bloc of attending behavior. This 30-min bloc of time was consistent with the criterion interval for Phillip's attending behavior in the laboratory setting and one which his teacher could reasonably manage in the regular classroom.

A point record form was placed on Phillip's desk each day in the regular classroom. Phillip's teacher was provided with a variable-interval schedule on which she gave one point to Phillip, on the average, of every 30 min of appropriate attending behavior. If Phillip engaged in other than appropriate attending behavior, the teacher was instructed to withhold reinforcement for the interval in which it occurred.

The data describing the results of the generalization program are presented in Fig. 4. After the first 10-min session the program appeared to maintain attending behavior at a high level.

DISCUSSION

As the data in Fig. 2 and Fig. 3 attest, systematic manipulation of the reinforcement

contingency during the individual conditioning program produced significant changes in the response measures of percentage of attending behavior and frequency and duration of non-attending behavioral events. Upon withdrawal of the reinforcement contingency, the behavior returned to pretreatment levels, thus indicating that the alteration in behavior was due to the manipulated, experimental variable rather than to the influence of an unknown or chance variable.

Under the generalization program, Phillip reconditioned quickly. As indicated earlier, Phillip was placed on a variable-interval 30-min schedule which delivered reinforcement on an average of once per 30 min for producing task-oriented, distraction-free behavior. The data in Fig. 4 were taken in a regular classroom setting where the number of potentially distracting stimuli was much greater than in the controlled setting where the subject was initially conditioned. Each tangible reinforcing event was accompanied by the administration of attention, praise, and social approval from the teacher. It is hoped that in future the higher rates of attending behavior produced by the subject will come under the control of such natural reinforcers as task com-

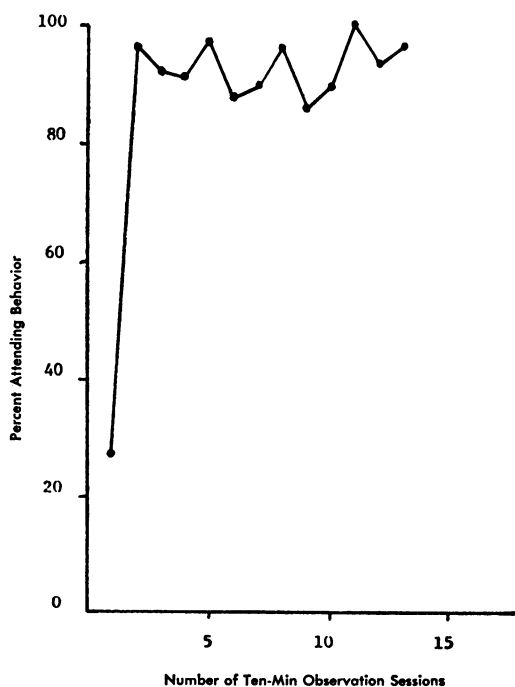


Fig. 4. Proportion of attending behavior in the regular classroom during the generalization program.

pletion, positive feedback, academic success, and the acquisition of new knowledge.

The functional analysis of Phillip's attending behavior suggests that individual conditioning techniques can be used to acquire efficient, reinforcement control over behaviors which are difficult to modify in regular classroom settings. Once the behavior has been brought under experimental control, procedures can be established to schedule generalization and to maintain the modified performance in settings where maintaining stimuli operate in an uncontrolled fashion. The results of this study appear to have implications for treatment of a variety of subject-specific behaviors which actively interfere with successful academic performance among children in the educational setting.

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